Multi Material Flexible Recovery Collaborative

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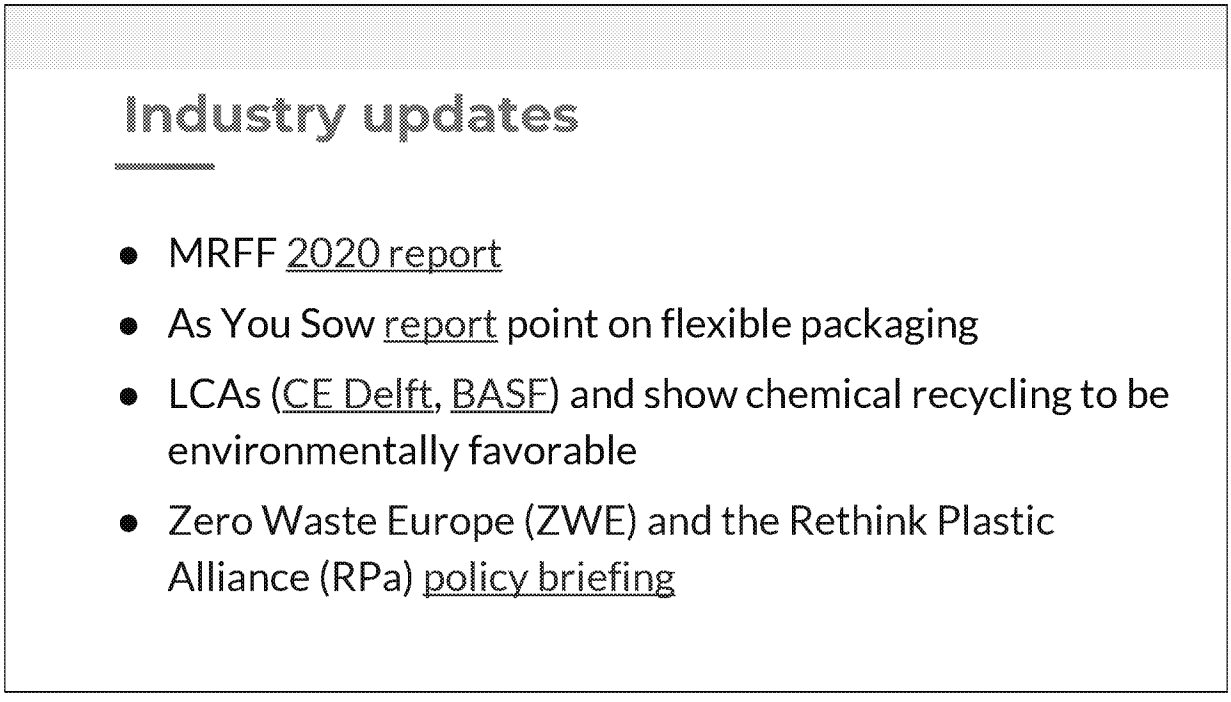
SUSTAINABLE PACKAGING COALITION®

Agenda

1. Welcome and industry updates
2. Review draft chemical recycling content for website
3. Laura Thompson - RMS updates and perspective



I am going to fly through these since there is other content I want to spend our time on tdoay but just to share..

MRFF - 74% capture rate FP, success in removing paper from flex bale and visa versa - multi layer = 18% of whole bale and flex bale markets - identifies end markets for MR→ coverboards for building/constructions (compression molding) to injection molding, profile extrusion, and pyrolysis applications.

AYS - The problem of flexible packaging - "There is little evidence of the swift movement needed to make this material recyclable in practice by the 2025 goal set by scores of companies. Some brands are touting chemical recycling as a solution, a range of technologies that can restore or recycle degraded and low-value plastic, but several of the technologies are concerning, and most are a decade away from being available at scale. Companies do not have the luxury of 10 years to ramp up new recycling solutions given the substantial ongoing impact of these materials on the environment. To meet the 2025 deadline, companies may need to move away from flexible packaging to materials that can be processed by the current mechanical recycling system."
A call to actrion for this group - resppond to this by making that timeline shorter.

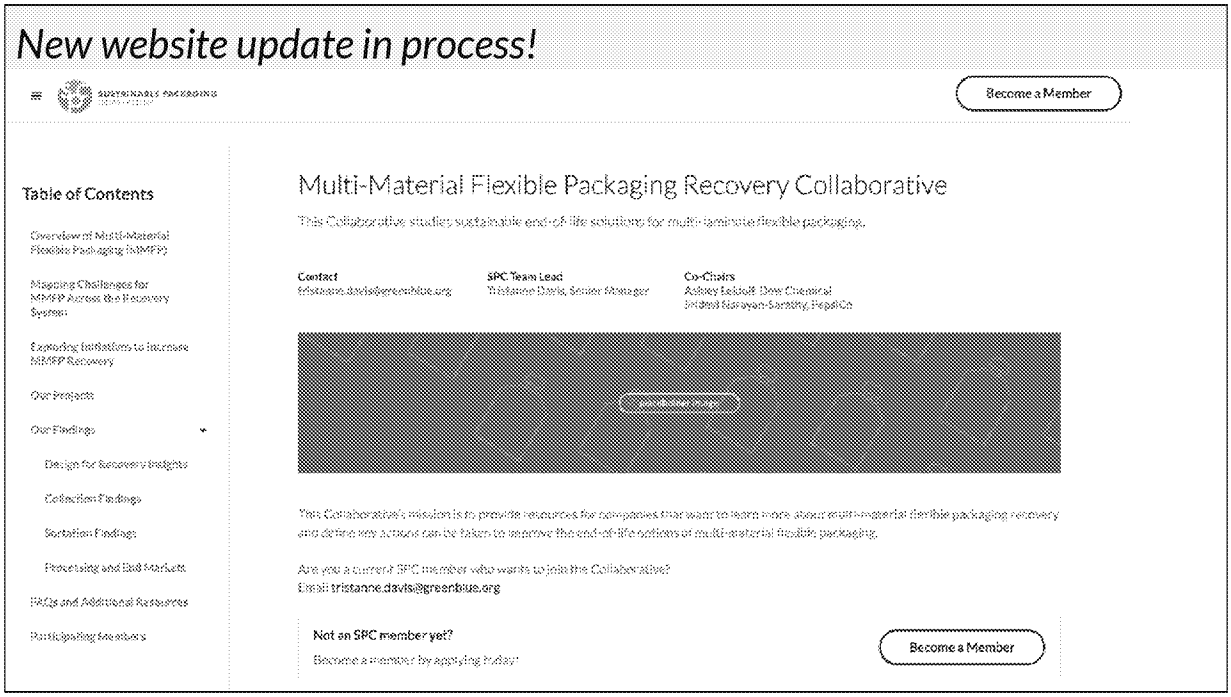
LCAs - we discussed previously how many studies are unfavorable, well not all of them are -

BASF: comes to the clear conclusion that chemical recycling (pyrolysis) of mixed plastic waste emits 50% less CO2 than incineration of mixed plastic waste; chemically recycled plastics cause significantly lower CO2 emissions than those produced from primary fossil resources; and manufacturing of plastics via either chemical recycling (pyrolysis) or mechanical recycling of mixed plastic waste results in similar CO2 emissions.
CE Felft - GHG footprint measured in terms of emissions and energy inputs and avoided products/energy carriers → pyro/gasification less emissions than incineration, gasification slightly higher than pyrolysis; Also MR has more emissions for mixed plastics than pyrolysis and gasification.
Point being - jury is out

ZWE - Whilst the former ("plastic to plastic" or "repolymerisation") may be considered as a way to "recycle" (subject to conditions considered hereafter) the latter ("plastic to oil/gas") is equivalent to 'recovery' and should never be considered as "recycling", from a strategic, operational and regulatory standpoint.
"We recommend only categorising as 'recycling', processes that yield outputs that are or can be directly converted into polymer materials." "so-called 'feedstock recycling' technologies should be categorised as 'recovery' as their outputs result in simpler chemicals (e.g. hydrocarbons or syngas) that cannot be directly converted into plastics but need to be further processed in several steps to yield a polymer again."

" Limit chemical recycling feedstock to contaminated and degraded durable plastics."
"Establish a robust methodology for calculating the climate impact "
"EU funds should only support processes with a lower carbon footprint than the production of plastic from virgin feedstock."

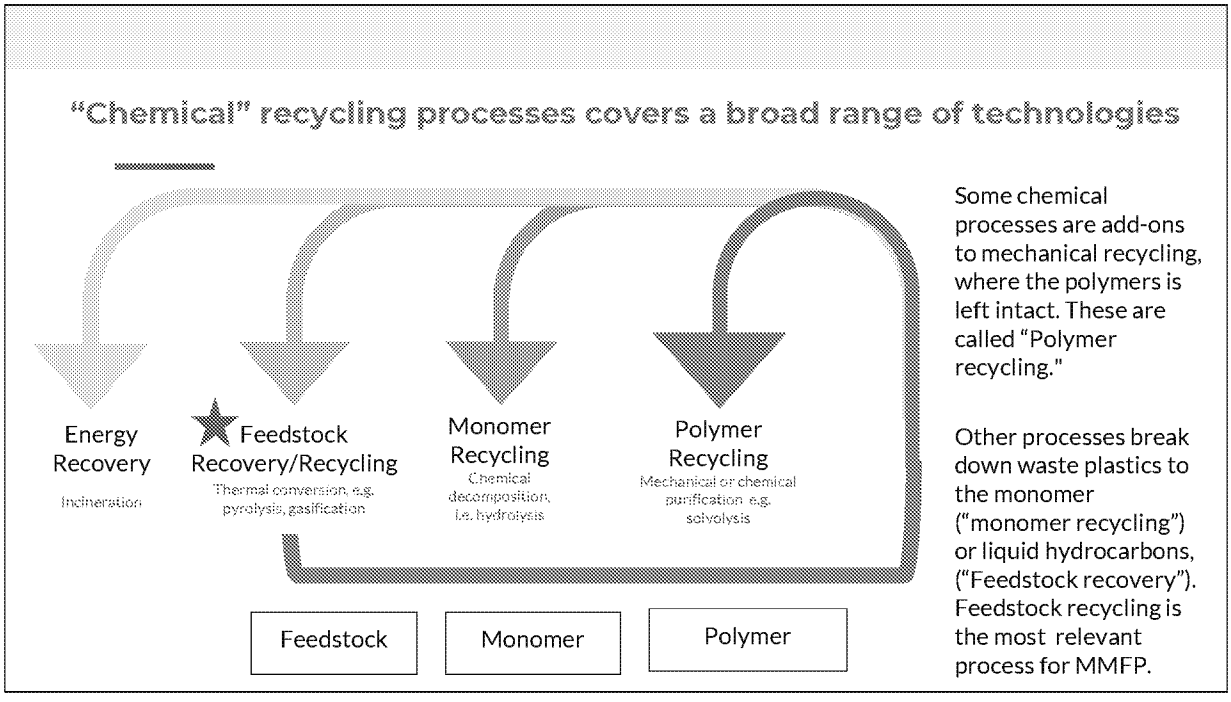
Comments? Qs?



A sneak peak! Will send out to you for input as well once all backend in place - this is a lot of content from our already existing site, updated. And adding in our new findings re CR. So some is just user-friendliness and general updates, and some is new content - based on our convos. This leads me to uor next agenda item

I have been putting together all your comments and convo we have been having over last several meetings and following our workshop in April - adding this to our “lessons learned” and “findings” sections, which I sent around to you all and want to have a final discussion on today. Meant to highlight ‘what have we learned’ and ‘our position’ and help lead us to next steps for this group.

I will present it all and then we will have time for discussion after..want to get it all out



First off, settling on and clarifying terms used. These have gone through review at SPC and chairs.. Reflects I hope comments you all have made and preferences expressed as well as our (SPCs) opinion. . For us. Don't want to spend more time on this. Not main feature of website, but will add to website in little break out box that says 'clarifying terms' like in Doc I sent you - to clarify terms used elsewhere on the website.

POLYMER RECYCLING
Some chemical processes are add-ons to mechanical recycling, where the polymers is left intact. These are called "Polymer recycling."
New technologies are emerging (chemical purification) that use chemical and water-based solvents to dissolve bonds between layers, separating them. These processes can be added onto existing mechanical recycling processes and can expand the markets to those of distinct polymers, rather than send the package to a mixed flexible plastics bale that could potentially be destined for less preferable forms of recovery like waste-to-energy. These technologies are very promising additions to the capabilities of mechanical recycling for MMFP, however have yet to be applied at scale. Often these technologies require pure streams of specific laminated packaging types, as different solvents work to separate different combinations of layers (i.e. PET/PET), and one solvent may not work for all varieties of MMFP in mixed plastics bales. Not really hcemical, can also be water-based. Really just an add-on to mechanical.
MONOMER RECYCLING
Other processes break down waste plastics to the monomer ("monomer recycling") - i.e. chemical decomposition - does not apply to mixed polyolefins so in this group we would not really use it)but for convos on PET CR for example you would)

FEEDSTOCK RECYCLING
These processes break down waste plastics to hydrocarbons, - most relevant process for MMFP.
The term Feedstock Recovery is used to broadly cover all of these outputs of these processes. It can be called Feedstock Recycling when its outputs are put towards non-fuel use, per ISO definitions which state "Material Recycling is defined as reprocessing, by means of a manufacturing process, of a used packaging material into a product, a component incorporated into a product, or a secondary (recycled) raw material, excluding energy recovery and the use of the product as a fuel." Polymer manufacturers can use this output as feedstock to produce new products.
Reflects the concept that this is feedstock for MM like Dow and Shell and others, who use this term
Lots of ppl here expressed approval of this term
As a group we can use this term when talking about those technologies - i.e. pyrolysis and gasification - and other terms when talking about those other technologies, i.e. polymer recycling using chemical purification technologies. "Chemical" recycling is the broadest term and applies of all of these processes that have chemical components, but for purposes of this group, we should be clear - we are mostly talking about feedstock recycling - those are the projects for mmfp we are seeing most scaled around the world. So consider this our PSA on the terms. You can still say "CR" when speaking braodly, but for specific tech solutions for MMFP best to clairfy feedstock or chemical

MMFP in the Circular Economy

Products and packaging do not need to be put back into exactly the same products they came from. In fact, a variety of diverse end markets is desirable from an economic perspective to scale up recovery incentives for these materials.

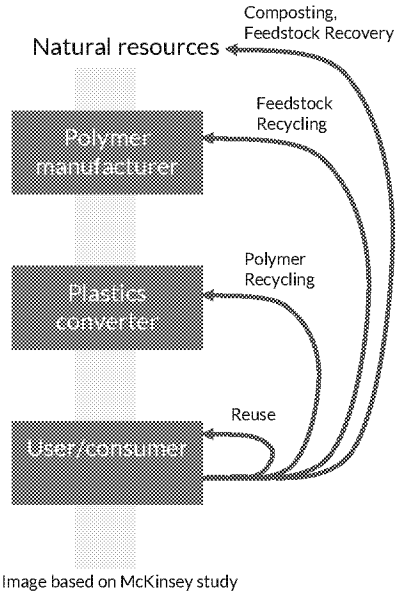
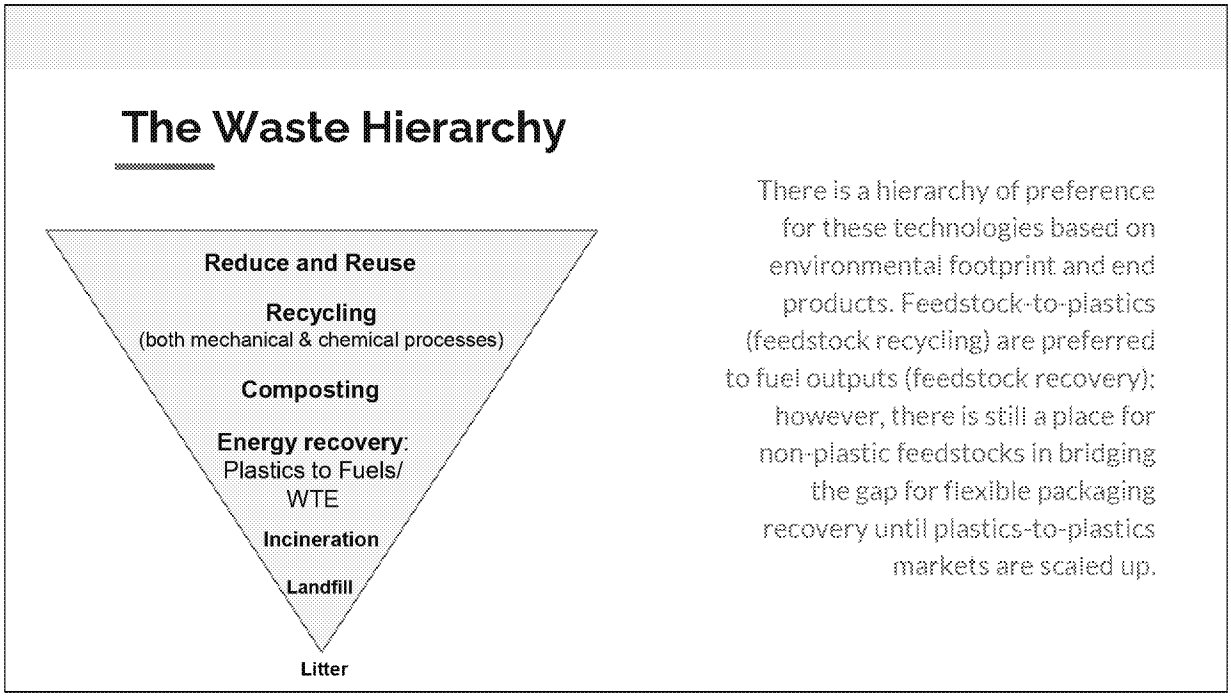


Image based on McKinsey study

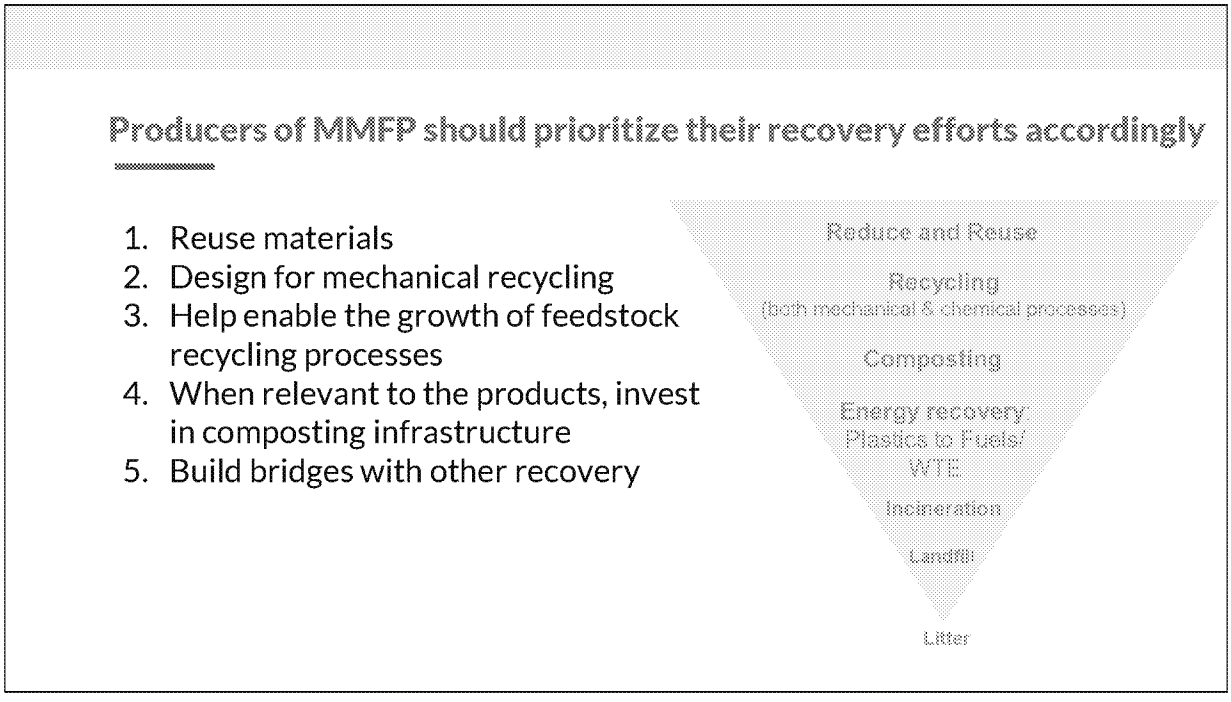
This group's main goal is to increase MMFP recovery, e.g. to keep it out of the environment and have it be part of the circular economy. To that end...

looking at at the relationship between these recovery options is in terms of different loops in the circular economy. MMFP can fit into the circular economy through an inner loop of reuse of the package, a middle loop of polymer recycling - flake or pellets go to the converter, an outer- middle loop of feedstock recycling - hydrocarbon outputs used by MMs to produce new pellets/chemicals, and an outer loop of composting, which brings the materials back to the raw elements of nature and also feedstock recovery when used as fuels - since displaces need for virgin fuels. All of these represent opportunities for MMFP in the circular economy.

SPC likes this way of looking at it bc it shows - Products and packaging do not need to be put back into exactly the same products they
came from. In fact, a variety of diverse end markets is desirable from an economic perspective to scale up recovery incentives for these materials.



This translates as well into the waste hierarchy as we have been discussing.
There is a hierarchy of preference for recovery technologies based on environmental footprint and end products. Feedstock-to-plastics (feedstock recycling) are preferred to fuel outputs; however, there is still a place for non-plastic feedstocks in bridging the gap for flexible packaging recovery until plastics-to-plastics markets are scaled up. I.e. they are still a form of recovery.
So in this version we are keeping it simple, this is how that fits into the hierarchy:
Following Reduction and Reuse, the most preferable forms of recovery are Recycling (including both chemical and mechanical processes that meet ISO definitions for recycling), (alla Victor, recycling is recycling and these are the working definitions..feedstock counts if goes to non fuel markets)...
Then followed by Composting, and Energy Recovery processes where plastics are either used as fuels or energy is used for heat/generating electricity (i.e. feedstock recovery when used as fuels), then Incineration where energy is not recovered, Landfill, and finally Litter or unmanaged waste.
Aligned also with LCAs in general -
Based on this hierarchy, producers of MMFP should prioritize their recovery efforts accordingly.

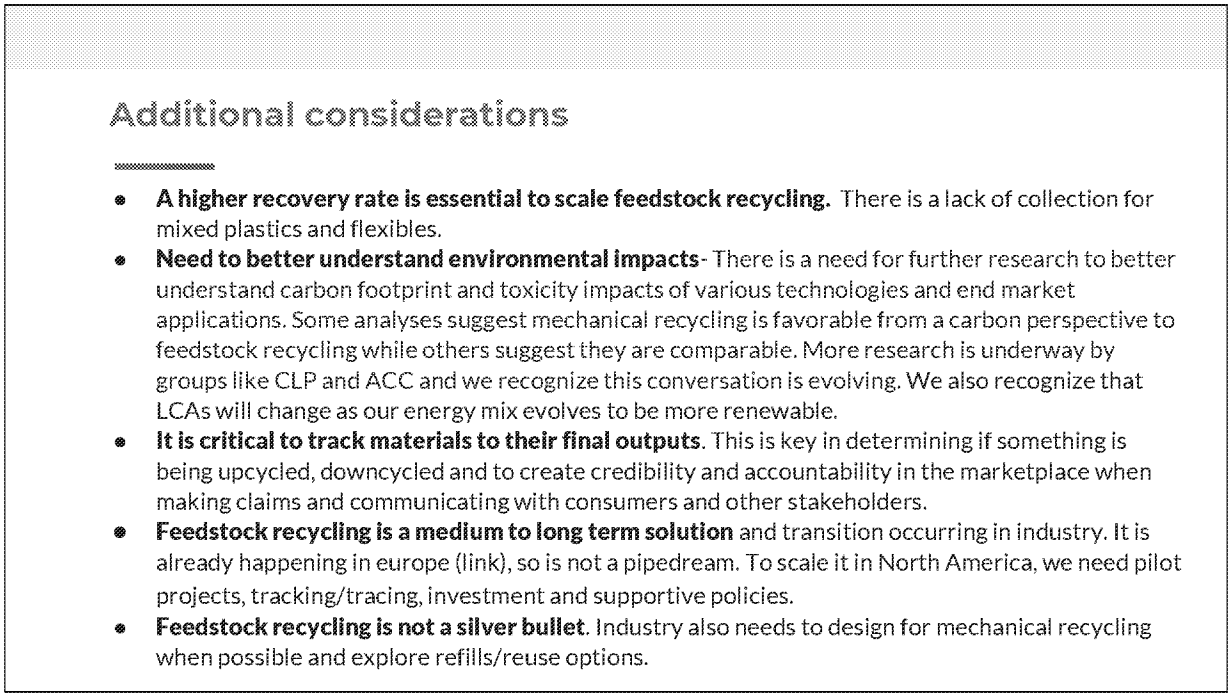


Producers of MMFP should prioritize their recovery efforts accordingly.

Reuse materials - Wherever possible, explore and innovate new reusable packaging models.
Design for mechanical recycling - Wherever possible, explore mono-material designs that are more widely recyclable in today's existing mechanical recycling infrastructure and can be collected through existing store-drop off programs and curbside programs in some places. Best practices for light use of barriers in mono-material packaging can be found in CEFLEX's Design for Circular Economy Guidelines and The Association of Plastic Recyclers' Design Guide.
Help enable the growth of chemical recycling processes - When performance needs require the use of multi-material flexible packaging, then mechanical recycling on its own is not likely viable for the breadth of flexible packaging designs/material combinations. Investing in pilot projects and testing new processes that can increase the viability of recycling of these materials isrequired to scale these technologies. This includes both polymer recycling through use of chemical purification and feedstock recycling for MMFP.
When relevant to the products, invest in composting infrastructure- Compostable packaging is a good solution for specific types of MMFP that are food packaging and may be soiled, thereby limiting prospects for recycling. If putting compostable material onto the market, it is advisable to also invest in developing collection infrastructure to manage those materials, enabling them to be effectively composted.
Build bridges with other recovery - The end use of plastics as fuels or energy are seen in general as a less desirable recovery option for MMFP, as the ability to continuously re-use materials is eliminated when material is burned as fuel or energy. However, there is still a place for these outputs in bridging the gap for flexible packaging recovery, especially in the context of Feedstock Recovery, as a replacement for virgin inputs and until plastics-to-plastics markets are scaled up.

Not all packaging can be mono material in near term. Reuse is growing but...Feedstock recycling technologies are going to be necessary to address
recovery/recycling of multilayer flexible packaging by expanding possibilities for end markets. We want to make these positives clear on the website -

Feedstock recycling:
● Produces virgin-like plastic from mixed plastic waste that currently cannot be recycled. This addresses limits with the quality of recycled content currently available on the market via mechanical recycling and creates new markets for these materials;
● Potentially solves issues around food safety and FDA compliance for recycled contact;
● Complements mechanical recycling, providing recycling options for mixed plastic waste while not cannibalizing existing recycling streams and markets;
● Needs more collaboration on pilots across the value chain to scale these technologies;
● Drives economic growth by adding jobs to the system and new areas of expertise and technical know-how;
● Helps maintain the social license to use these materials, enabling the continuation of environmental benefits of flexible packaging like material efficiency and lower emissions profiles compared to rigids, as well as a key role in avoiding food waste.



We also need to be transparent and express the risk factors. There are some additional important points that must be taken into account:

● A pathway to collection of all flexible packaging is essential to scale feedstock recycling. There is a lack of collection for mixed plastics and
flexibles, and it is critical to establish pathways for collection that will eventually serve to supply feedstock recycling.
● There is a need to better understand environmental impacts - There has been research by groups like CE Delft and BASF suggesting that feedstock recycling is similar in impact to polymer recycling, however there is a need for further research to better understand nuances related to carbon footprint and toxicity impacts of various technologies and end market applications. We also
recognize that LCAs will change as our energy mix evolves to be more renewable.
● It is critical to track materials to their final outputs. This is key in determining if something is being upcycled, downcycled and to create credibility and accountability in the marketplace when making claims and communicating with consumers and other stakeholders. GreenBlue's Recycled Materials Standard is
working to establish this process.
● Feedstock recycling is a medium to long term solution and transition occurring in industry. It is already entering the market in Europe and has new partnership projects in place in the U.S. We need additional efforts to support scale these technologies in North America, however, such as pilot projects, scaling of existing pilots, tracking/tracing, investment and supportive policies.
Feedstock recycling is not a silver bullet. Industry also needs to design for mechanical recycling when possible and explore refill/reuse and composting options.

RMS update & perspective

Tracking and tracing is critical to support feedstock recycling

one of our takeaways was...

Three types of tracking systems will lead to different label types

Average Volume 1

Mass Balance 2

ARC Trading 3

GREENBLUE®

Next Steps for the MMFR Collaborative

- Publish website updates/communications that companies and governments can use this as a resource.

- Moving forward, where can we effect change?
    - SPC is brainstorming new flexible packaging work - would like this group to support that.
    - Update recovery technologies map - tracking developments in feedstock recycling
    - Support CEFLEX Phase 2 guidelines
    - Support pilot project in US? (using RMS?)
    - Other ideas?

Want feedback on the substance more than the linguistics

We may not get to all of this today and will discuss over the next few meetings/offline as we draft our position and put onto the website